

REMARKS/ARGUMENTS

Claims 1-17, 19-24 and 27-31 are pending in this case. In the Office Action mailed October 31, 2003, all pending claims 1-17, 19-24 and 27-21 were rejected. Claims 1, 8, 12, 14-17, 19, 22, 24, and 27 have been amended. Claims 11, 13, 21, 23 and 28-31 are cancelled. Claims 1-10, 12, 14-17, 19-20, 22, 24 and 27 remain pending in the case.

No new matter has been included in any of the following claim amendments. Claim 1 has been amended to specify the relative temperatures of the first and second anneals. Claim 1 has been further amended to remove the recitation of "the steps of". Claim 8 has been amended to recite that the first anneal is performed by rapid thermal annealing. Claim 12 has been amended to specify the relative partial pressures of the first and second anneals. Claim 12 has been further amended to remove the recitation of "the steps of". Claim 14 has been amended to recite that the second anneal is performed by rapid thermal annealing. Claim 15 has been amended to recite that the first partial pressure is less than ten percent of one atmosphere. Claim 16 has been amended to recite that the first anneal is performed by rapid thermal annealing. Claim 19 has been amended to recite that the second partial pressure is less than five percent of one atmosphere. Claim 22 has been amended to provide proper claim dependency. Claim 24 has been amended to provide proper claim dependency. Claim 27 has been amended to specify the relative temperatures of the first and second anneals. Claim 27 has been further amended to remove the recitation of "the steps of".

Claims 1-6, 12-14, 21, 23, 24, 27-31 are rejected under 35 USC 102(e) as being anticipated by Mochizuki et al (US Patent No. 6,190,957). Claims 7-11, 15-17, 19-20 and 22 are rejected under 35 USC 103(a) as being unpatentable over Mochizuki et al as applied to claims 1-6, 12-14, 21, 23, 24, 27-31 above. The rejections under 35 USC 102(e) and 35 USC 103(a) are respectfully traversed.

The present invention teaches that a perovskite phase can be obtained by the first anneal, and thereafter, the step of forming a "lid", i.e. the top electrode layer covering the layer of ferroelectric dielectric material, is executed. The top electrode formation is followed by a second anneal. Through the second anneal, crystallization of the layer of ferroelectric dielectric material can be completed.

The present invention also teaches that the second anneal is performed by rapid thermal annealing, and the second annealing temperature is adjusted higher than the first annealing temperature, as now claimed.

The present invention also teaches that the partial pressure of the second anneal is less than the partial pressure of the first anneal, as now claimed.

Through the combination of the first and second anneals as taught and claimed in the present invention, ferroelectric performance is significantly improved, and so highly integrated ferroelectric capacitors which have excellent characteristics can be implemented.


In contrast, Mochizuki teaches that a first RTA process is performed for ten seconds at 800 °C at a rising temperature rate of 100 °C /second in an atmosphere of oxygen having a pressure of 10 Torr (see col. 34, lines 39-41). Moreover, Mochizuki teaches that a Pt film serving as the upper electrode film is formed on the PZT film by DC sputtering, and a diffusion furnace is operated so that the second annealing is performed slowly at 600 °C (col. 34, lines 41-44).

It is deemed, therefore, that claims 1, 12 and 27 are allowable as containing bona fide limitations that are neither taught nor suggested by Mochizuki. Claims 1, 12 and 27 are thus deemed to be allowable under both 35 USC 102(e) and 35 USC 103(a). The remaining pending claims are deemed to be allowable as depending from an allowable base claim.

A check is provided for the enclosed Information Disclosure Statement.
However, any additional fee deficiency associated with this submittal may be
charged to Deposit Account No. 50-1123.

Respectfully submitted,

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